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(54) EMISSION CONTROL UNIT

(71) We, DEUTSCHE GOLD-UND SILBER-SCHEIDEANSTALT VORMALS ROESSLER, a body corporate organised under the laws of Germany, of 9 Weissfrauenstrasse, 6 Frankfurt Main 1, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an emission control unit.

More particularly the invention relates to an emission control unit with a vibration-free monolith catalyst mounting, more especially for purifying the exhaust gases from internal combustion engines, consisting of a housing of preferably circular cross-section with an exhaust-gas inlet and outlet at its ends and of a catalyst monolith held in the housing by an elastic mass which surrounds it and which bears under pressure against the housing wall.

At present, exhaust gases from internal combustion engines are purified *inter alia* by means of catalytic post-combustion units. Units of this kind generally consist of a metal housing in which catalysts are accommodated in suitable form. The catalyst can be in the form of loose particles or in the form of impregnated ceramic bodies with narrow gas-traversed bores, in which post-combustion of the exhaust gases takes place. These bodies can be in one piece (so-called monoliths). The monolith of ceramic material has to be anchored in the metal housing. In some known designs, the monolith is cemented in. One disadvantage of this particular anchoring method is that the cement bond can be heavily stressed to the point of breakage, on the one hand by mechanical vibration and on the other hand by the combustion gases issuing from the cylinders in a rapid sequence of impulses. Added to this is the differential thermal expansion of ceramic and metal which, at high temperatures, lifts the metal housing off the rigidly cemented ceramic core.

In other known designs, the monolith is pressed in with an elastic mass between the housing and body. This mass has to be kept under such a high pressure that, despite the considerably greater thermal expansion of the housing at elevated temperature, it still holds the monolith sufficiently firmly. After prolonged service, the steel jacket of the housing can expand to such an extent that the pressure by which the ceramic monolith is held in position decreases, with the result that the monolith is no longer anchored sufficiently firmly in the housing. Added to this is the fact that elastic masses readily lose at least some of their elasticity at elevated temperature.

According to the invention, the disadvantage of the high contact forces and of the deterioration in the elasticity of the elastic mass can be obviated by making the housing and, optionally, the monolith as well slightly conical and continuing the conical housing behind the monolith for a distance which is sufficient, in the event of expansion of the housing, to provide the monolith surrounded by the elastic compound with sufficient space to be reanchored under the exhaust-gas pressure building up.

Accordingly, the present invention provides an emission control unit with a vibration-free monolith catalyst mounting, consisting of a housing of preferably spherical cross-section with an exhaust-gas inlet and outlet at its ends and of a catalyst monolith held in the housing by an elastic mass which surrounds it and bears under pressure against the housing wall, the housing for the monolith tapering at an angle of 2 to 6° in the direction of flow of the exhaust gas and being longer than the monolith.

The holding function is performed by the cone-shaped housing. The effect of the taper is that the cone is self-wedging. The monolith is pressed into the cone by the

gases issuing from the engine. Since the gases issue at a high impulse frequency, they hammer the monolith into the cone. Since, behind the monolith, the housing continues to taper over a sufficient distance, the monolith surrounded by the elastic mass has sufficient space in which to be reanchored in the event of expansion of the housing.

In general, the housing should be longer than the monolith by at least 5% of the length of the monolith.

In one particularly satisfactory embodiment, the monolith is tapered in the direction of flow of the exhaust gases, preferably in accordance with the taper of the housing.

Another effective embodiment of the unit according to the invention comprises a cylindrical monolith surrounded by a conical, elastic mass with a cylindrical inner bore. In this embodiment, a particularly high degree of reliability in operation is obtained if the adhesion between the ceramic monolith and the elastic mass is considerably greater than the adhesion of the elastic shape in the metal housing, or if the ceramic monolith is bonded to the elastic mass.

The elastic mass need no longer consist of soft mineral wool, asbestos wool, or glass wool or of wire gauze. Instead it is possible to use heavily consolidated qualities, for example mechanically preformed and consolidated Fiberfrax (fibrous aluminium silicate) packs of high durability, even at elevated temperature (Fiberfrax is a Trade Mark). The effect of these shapes can be confined to keeping vibration emanating from the vehicle away from the ceramic body, to equalising inaccuracies in manufacture and to preventing direct contact between the metal housing and the ceramic monolith.

In one effective embodiment of the invention, a consolidated shape of this kind is bonded to the monolith. Finally, it can be of advantage, in order to prevent the conical internal insert, consisting of the monolith and elastic shape, from being displaced from the housing, to arrange a retaining plate fixed to the housing wall in front of the upstream end of the elastic mass.

The invention is described in more detail in the following with reference to the accompanying drawings, wherein:

Figure 1 shows a unit according to the invention with a conical monolith.

Figure 2 shows a unit according to the invention with a cylindrical monolith.

Figure 3 shows the arrangement of a retaining plate on the elastic mass.

As shown in Figure 1, a conical monolith 2 is held in a conical housing 1 with an elastic shape of uniform wall thickness 3 in between.

According to Figure 2, a cylindrical monolith 5 is firmly held in a metallic, conical housing 1 by a conical elastic shape 4 with a cylindrical inner bore. A retaining plate 6 fixed to the housing wall is arranged at the upstream end of the elastic mass. As shown in Figure 3, which shows the area of Figure 2 designated by the circle on a larger scale, the retaining plate is fixed to the housing 1 by welding.

WHAT WE CLAIM IS:—

1. An emission control unit with a vibration-free monolith catalyst mounting, consisting of a housing with an exhaust-gas inlet and outlet at its ends, and of a catalyst monolith held in the housing by an elastic mass which surrounds it and which bears under pressure against the housing wall, the housing tapering at an angle of 2 to 6° in the direction of flow of the exhaust gas and being longer than the monolith.

2. An emission control unit as claimed in Claim 1 wherein the housing is of circular cross-section.

3. An emission control unit as claimed in Claim 1 or 2, wherein the housing is longer than the monolith by at least 5% of the length of the monolith.

4. An emission control unit as claimed in any of Claims 1 to 3 wherein the monolith tapers in the direction of flow of the exhaust gases.

5. An emission control unit as claimed in Claim 4 wherein the monolith tapers in accordance with the taper of the housing.

6. An emission control unit as claimed in any of Claims 1 to 3 comprising a cylindrical monolith surrounded by a conical elastic mass with a cylindrical inner bore.

7. An emission control unit as claimed in any of Claims 1 to 4, wherein the elastic mass is a pressed shape.

8. An emission control unit as claimed in Claim 6 wherein the elastic mass is a consolidated fibrous aluminium silicate pack.

9. An emission control unit as claimed in Claim 7, wherein the pressed shape is bonded to the monolith.

10. An emission control unit as claimed in any of Claims 1 to 8, wherein a retaining plate fixed to the housing wall is arranged in front of the upstream end of the elastic mass.

11. An emission control unit substantially as hereinbefore described with reference to the accompanying drawings.

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Fig. 1

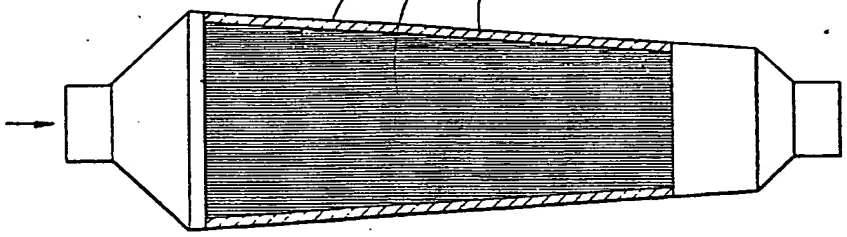

Fig. 2.

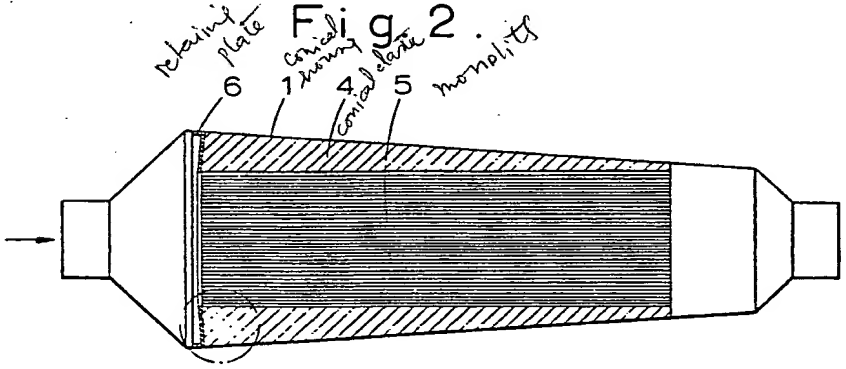

Fig. 3.